T. O. 33D7-50-12-1

TECHNICAL MANUAL

OPERATION INSTRUCTIONS

ADAPTER, TEST
MX-6877/URT-21
AND
ADAPTER, TEST
MX-6878/URT-21

(MAGNAVOX)

B-31

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE

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SECTION I
GENERAL DESCRIPTION

1-1. SCOPE

1-2. This publication contains the description, installation, operation, theory, maintenance and table of replaceable parts for Adapter, Test MX-6877/URT-21 and MX-6878/URT-21 manufactured by The Magnavox Company, Fort Wayne, Indiana.

1-3. PURPOSE

1-4. Adapter, Test MX-6877/URT-21 and MX-6878/URT-21 are used to check the performance of Beacon Set, Radio AN/URT-21. Adapter, Test MX-6877/URT-21 is designed for use with Transceiver Test Set Model T-906 and Adapter, Test MX-6878/URT-21 is designed for use with Transceiver Test Set Model P-806. Since Adapter, Test MX-6877/URT-21 and MX-6878/URT-21 are identical, except for minor circuitry differences, both types hereafter are referred to as the Test Adapter (see figure 1-1).

Figure 1-1. Test Adapter

NOTE

Specific differences between Test Adapters will be identified by type numbers (MX-6877/URT-21 or MX-6878/URT-21).

1-5. PRINCIPLE OF OPERATION

1-6. The Test Adapter is designed to securely hold Beacon Set, Radio AN/URT-21 under test when used in conjunction with the Transceiver Test Set. The Test Adapter contains a zener diode regulated power supply which may be substituted for the beacon battery and a volt-ammeter for checking battery voltage and current. In addition, the Test Adapter detects the RF power output from the antenna and connects it to the ACCEPT/REJECT meter located on the Transceiver Test Set.

1-7. DESCRIPTION

1-8. The Test Adapter consists of an aluminum chassis 10.5 inches long, 5 inches wide and 4.1 inches high and weighs 2.3 pounds. A snap-action clamp secures the Radio Set Beacon to be tested to the Test Adapter. Located on the Test Adapter are two switches, a meter, four test connectors, an antenna ground cable, power cable and an antenna output contact.

SECTION II
INSTALLATION AND ADJUSTMENT

2-1. UNPACKING

2-2. The Test Adapter is shipped in individual containers by Method III pack. Although no special handling precautions are required, the care and treatment of the Test Adapter should be the same as that normally extended to similar electronic equipment.

2-3. STORAGE

2-4. In storage of the Test Adapter in the Transceiver Test Set case, first place all other adapters in the compartment so that the Test Adapter is on top. The Test Adapter should be set in an upright position (meter face up) and the resilient protective padding should be placed over the Adapter. This procedure will protect the meter face during transportation.

2-5. ADJUSTMENT

2-6. The Test Adapter has been adjusted and tested prior to shipment, however, each adapter must be calibrated to the individual Transceiver Test Set to which it is assigned. Prior to use, verify that the Transceiver Test Set (Model T-906 or P-806) TRANSMITTER RECEIVER PERFORMANCE meter has been properly calibrated as described in the applicable Instruction Manual for that model.

2-7. INSTALLATION

2-8. The Test Adapter MX-6877/URT-21 is designed for use with the Transceiver Test Set Model T-906 and MX-6878/URT-21 is designed to be used with Transceiver Test Set Model P-806. Place both Test Set and Test Adapter on a flat surface and connect P1 of the Test Adapter to J106 of the Test Set.

SECTION III
OPERATING PROCEDURES

3-1. GENERAL

3-2. The operating procedures are described using a Test Adapter, in conjunction with a Transceiver Test Set, to check the performance of Beacon Set, Radio AN/URT-21. The operating procedures consists of a RF power output test and a battery test. (See figure 3-1).

3-3. RF POWER OUTPUT TEST. This test should be performed each time the parachute is repacked or every 120 days, whichever occurs first.

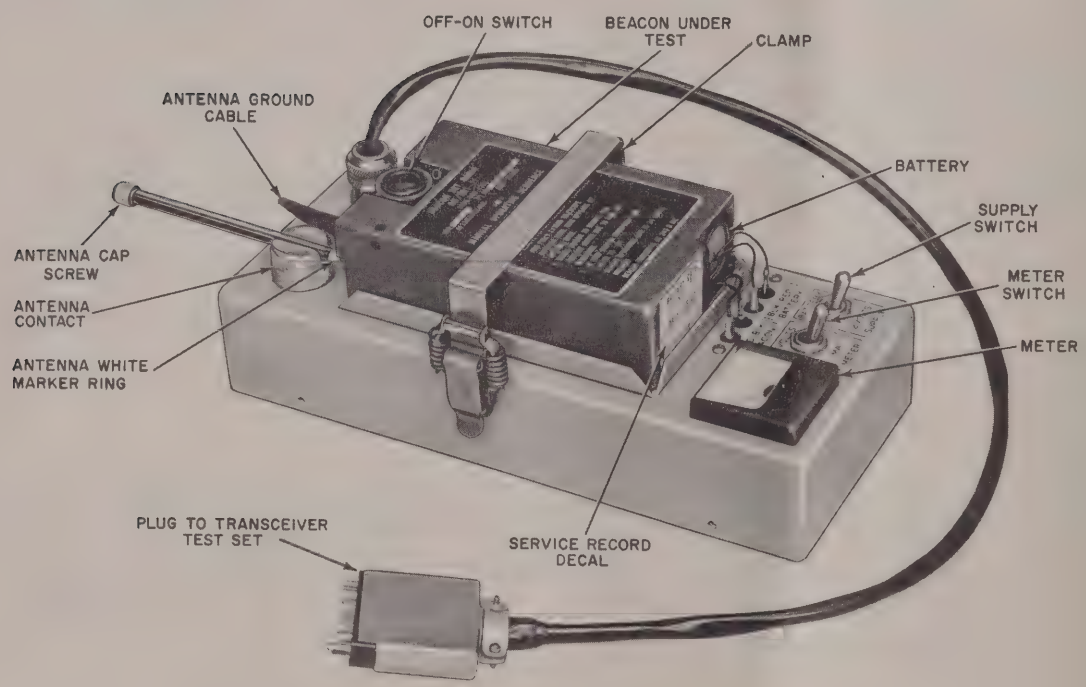


Figure 3-1. Beacon Set, Radio AN/URT-21 Attached to Test Adapter

a. Position Transceiver Test Set switches as follows:

(1) RECEIVE/TRANSMIT switch in "TRANSMIT" position.

(2) Power Switch in "INTERNAL POWER" position.

(3) Meter function switch in "URC-10 VOLTAGE" position for Transceiver Test Set Model T-906 and in the "PLATE VOLTAGE" position for Transceiver Test Set Model P-806.

b. With the beacon switch in the "OFF" position remove lanyard plug.

c. Unwind lanyard retention cord from around the beacon case.

d. Fully extend the largest section of telescopic antenna (other sections collapsed) so that white ring is visible.

e. Place beacon on the Test Adapter and secure with snap action clamp. Attach the ground wire to flexible antenna connector and turn beacon switch to "ON" position.

f. The beacon output has a pulsating duty cycle. Read the meter at point of maximum upward swing. An acceptable beacon will read in the ACCEPT region of the TRANSMITTER RECEIVER PERFORMANCE meter. If meter reads in REJECT region continue testing per paragraph 3-4 (BATTERY TEST).

g. Remove beacon. With the condition of paragraph 3-3-d connect an ohmmeter between the flexible antenna ground connector and the telescopic antenna. Ohmmeter shall indicate short. Collapse last section of antenna, greater than one-half its length, so the white band is no longer visible. Ohmmeter shall read open. Reject beacon of these conditions are not met.

h. Turn beacon to "OFF" position, reinsert lanyard plug, and remove beacon from Test Adapter. Secure telescopic antenna, finger tight, using antenna cap screw.

i. Record date of beacon test on decal located on bottom of beacon.

3-4. BATTERY TEST. The battery test is to be performed only if beacon has been rejected for low RF power.

NOTE

Mercury cells provide nearly constant voltage under load until end of its life has been reached, therefore the battery test only indicates the present state of the battery and does not determine its remaining life.

a. Position the switches of the Transceiver Test Set as described in paragraph 3-3 a.

b. Remove battery cover plate from beacon and disconnect battery and beacon terminals.

c. With battery still within beacon and with flexible antenna extended as described in paragraph 3-3 d. secure beacon per paragraph 3-3 e. to the Test Adapter. Observe lead color code and connector markings while connecting the beacon and battery terminals to the Test Adapter connectors (BEACON and BATTERY).

d. With the METER switch in the "VOLTS" position, the SUPPLY switch in the "BATTERY" position and the beacon switch in the "OFF" position, observe the open circuit battery voltage meter reading (13.5 volts nominal). If battery voltage is 12.5 volts or less replace battery.

e. Turn beacon switch "ON". Observe meter reading (12 volts nominal).

f. Place METER switch to "MA" and observe meter swing. Check battery by observing that meter swing is relatively the same with SUPPLY switch in "BATTERY" and "12 VOLTS" position.

NOTE

If TRANSMITTER RECEIVER PERFORMANCE meter reads in the ACCEPT region with the SUPPLY switch in the "12 VOLTS" position and in the REJECT region with the SUPPLY switch in the "BATTERY" position, replace battery. If the beacon reads in the REJECT region under both switch settings, replace beacon.

g. Turn beacon switch "OFF" and remove connections from the Test Adapter and remove beacon.

h. Reconnect beacon and battery connectors and install battery cover plate.

NOTE

In order to insure maximum beacon life, the battery should be replaced after extensive operation or after a maximum of two years from date of installation.

i. If battery is replaced, record date on decal located on bottom of beacon.

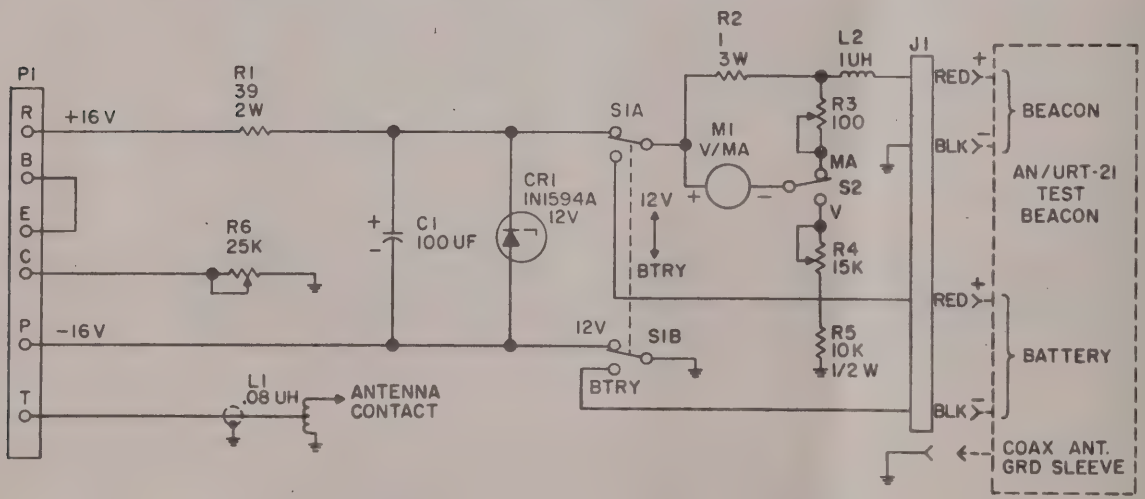
SECTION IV
THEORY OF OPERATION

4-1. GENERAL

4-2. The theory of operation for the Test Adapter is divided into the supply circuit, meter circuit and RF power circuit.

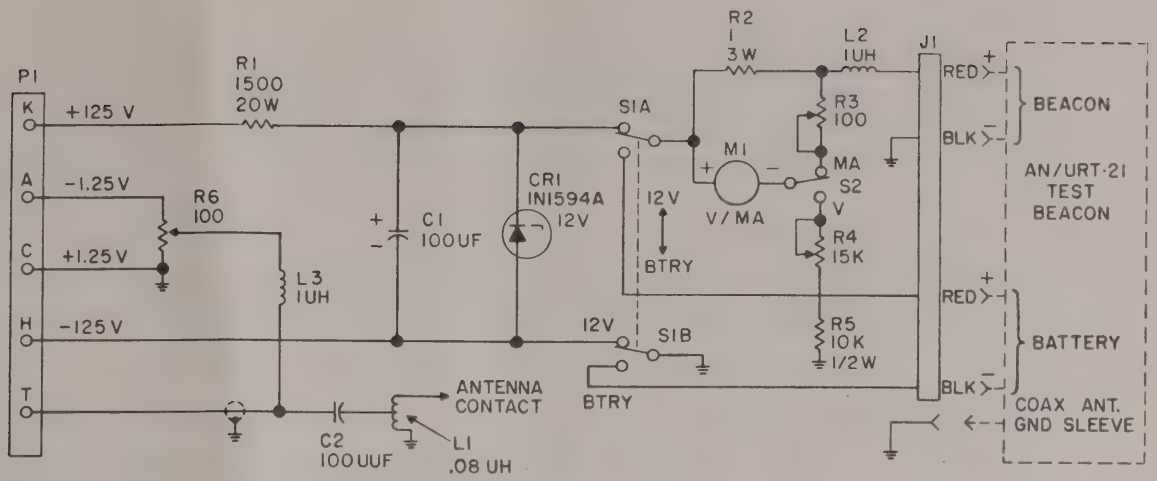
4-3. SUPPLY CIRCUIT. The 12 volt zener regulated supply for Test Adapter MX-6877/URT-21 (see figure 4-1) is derived from the 16 volt DC supply (pins R and P of J106) of the Transceiver Test Set. R1 is a current limiting resistor and C1 a current storage capacitor. Approximately 100 milliamperes are continuously drawn from the 16 volt supply. The beacon under test draws a peak current of 200 milliamperes on a pulsating duty cycle. The additional 100 milliamperes required during the on period are furnished by capacitor C1.

4-4. The 12 volt zener regulated supply for Test Adapter MX-6878/URT-21 (see figure 4-2) is derived from the 125 volt DC supply (pins K and H of J106) of the Transceiver Test Set. Resistor R1 and capacitor C1 provide the same function as described for Test Adapter MX-6877/URT-21.



LAST NO. USED
C1
CR1
J1
L2
M1
P1
R6
S2

Figure 4-1. Test Adapter MX-6877/URT-21, Schematic Diagram



LAST NO. USED
C2
CR1
J1
L3
M1
P1
R6
S2

Figure 4-2. Test Adapter MX-6878/URT-21, Schematic Diagram

4-5. METER CIRCUIT. The meter, M1, serves as either a 0-to-100 MA meter or a 0-to-15 voltmeter. This meter has a basic meter movement of 0-to-1 milliamperes. When the METER switch is switched to the "VOLTS" position, the meter is placed in series with both a fixed 10,000 ohm resistor (R5) and an adjustable 15,000 ohm resistor (R4) across the beacon supply terminals. By adjusting the total circuit resistance to 15,000 ohms, the meter acts as a 0-to-15 volt voltmeter with a resistance of 1000 ohms per volt. Resistor R5 protects the meter from excessive current during calibration in the event the adjustable resistor R4 is inadvertently set at a minimum resistance.

4-6. When the METER switch is placed to the "MA" position the meter is connected in series with a 0-to-100 ohm variable resistor (R3) and this combination is in parallel with a one ohm resistor (R2). By adjusting the series circuit until the total resistance is approximately 100 ohms the meter acts as a 0-to-100 milliampere current meter.

4-7. RF POWER CIRCUIT. Test Adapter MX-6877/URT-21 (see figure 4-1) telescopic antenna contact is fed to the top of impedance matching coil L1. A 50 ohm tap on L1 is fed through a 50 ohm RG-58/U coaxial cable to pin T of P1. The RF signal is then fed through P106 of the Transceiver Test Set (Model T-906) to the detecting circuit. The rectified

signal is fed through the 0-to-100 microampere TRANSMITTER RECEIVER PERFORMANCE meter, through an adjustable 0-to-25,000 potentiometer and through a 15,000 ohm resistor to ground. The junction of the potentiometer and resistor is fed to pin C of P106. By adjustment of R6 (0-to-25,000 ohm potentiometer) the sensitivity of the PERFORMANCE meter is adjusted until it reads one-half of full scale deflection with a detected input signal from a beacon under test which has been adjusted for an RF power output of 200 milliwatts.

4-8. Test Adapter MX-6878/URT-21 (see figure 4-2) operates similar to Test Adapter MX-6877/URT-21; however, since the Transceiver Test Set Model P-806 does not have the same type of detecting circuit, changes were required. Unlike the Model T-906, the sensitivity of the detecting circuitry in the P-806 cannot be adjusted. With the fixed sensitivity of the Model P-806, a 200 milliwatt RF power output from the beacon under test will not give one-half of full scale deflection. This is caused by the on-off characteristic of the beacon transmission and by the nature of the detecting circuitry. To remedy this situation a DC forward bias is supplied to the detecting circuit.

4-9. The 1.25 volt DC voltage (pins A and C of P1) are fed to R6, a 0-to-100 ohm potentiometer. The adjustable potentiometer tap is fed through the RF isolation choke L3 to the 50 ohm coaxial output cable. Capacitor C2 acts as a DC blocking capacitor. With a 200 milliwatt RF power signal from the beacon under test, R6 is adjusted until the PERFORMANCE meter reads one-half of full scale.

4-10. Inductor L2 is an RF isolation choke and assures similar power output readings from the beacon when battery is connected directly to the beacon and when it is connected through the Test Adapter to the beacon.

SECTION V
MAINTENANCE

5-1. GENERAL

5-2. The Test Adapter has been calibrated prior to shipment, however, since the sensitivity of Transceiver Test Set and its assigned Test Adapter may differ, recalibration of the adapter is required.

5-3. STANDARD TEST CONDITIONS

5-4. When calibrating meter M1, a power supply adjusted to 12.0 ±0.5 volts shall be connected to the battery terminals of J1 and a 120 ohm, 2 watt 5 percent resistor shall be connected to the beacon terminals of J1.

5-5. When calibrating RF power a AN/URT-21 Test Beacon, which has been adjusted for 200 milliwatts of RF power output, shall be installed in the Test Adapter.

5-6. ALIGNMENT AND TEST PROCEDURES

5-7. VOLTMETER ALIGNMENT. Connect the equipment as shown in figure 5-1 and proceed as follows.

a. Place SUPPLY switch in the "BATTERY" position.

b. Place METER switch in the "VOLTS" position.

c. Adjust R4 for a 12.0 ±0.5 volt reading on meter, M1.

d. After R4 adjustment, tighten shaft lock-nut without turning shaft.

5-8. MILLIAMMETER ALIGNMENT. Connect the equipment as shown in figure 5-1 and proceed as follows.

a. Place SUPPLY switch in the "BATTERY" position.

b. Place METER switch in the "MA" position.

c. Adjust the power supply voltage for a 100 milliampere reading on external meter, then adjust R3 for full scale deflection on meter M1.

d. After R3 adjustment, tighten shaft lock-nut without turning shaft.

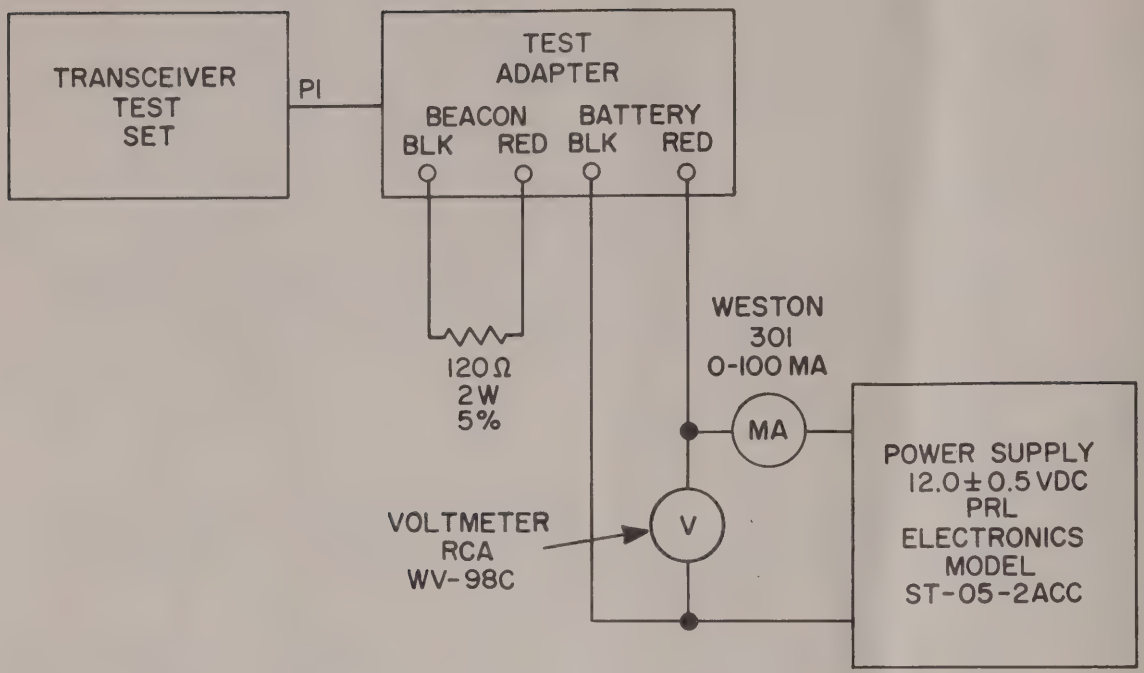


Figure 5-1. Meter Calibration Test Setup

5-9. ZENER DIODE. Connect the equipment as shown in figure 5-1 and proceed as follows.

a. Remove 120 ohm resistor from beacon terminals of J1.

b. Place the SUPPLY switch in the "12 VOLTS" position.

c. Place METER switch in the "VOLT" position.

d. Observe the voltmeter readings; if the voltmeter reads less than 11.4 or greater than 12.6 volts replace the Zener diode CR1. If the voltmeter reads within this range the Zener diode is operating properly.

5-10. RF POWER ALIGNMENT. Connect the equipment as shown in figure 5-2 and proceed as follows.

a. Place the METER switch in the "VOLTS" position.

b. Place the SUPPLY switch in the "BATTERY" position.

c. Adjust the Power Supply voltage to that value which gives 200 milliwatts of RF power output from the AN/URT-21 Test Beacon (see paragraph 5-11 for method of determining voltage value).

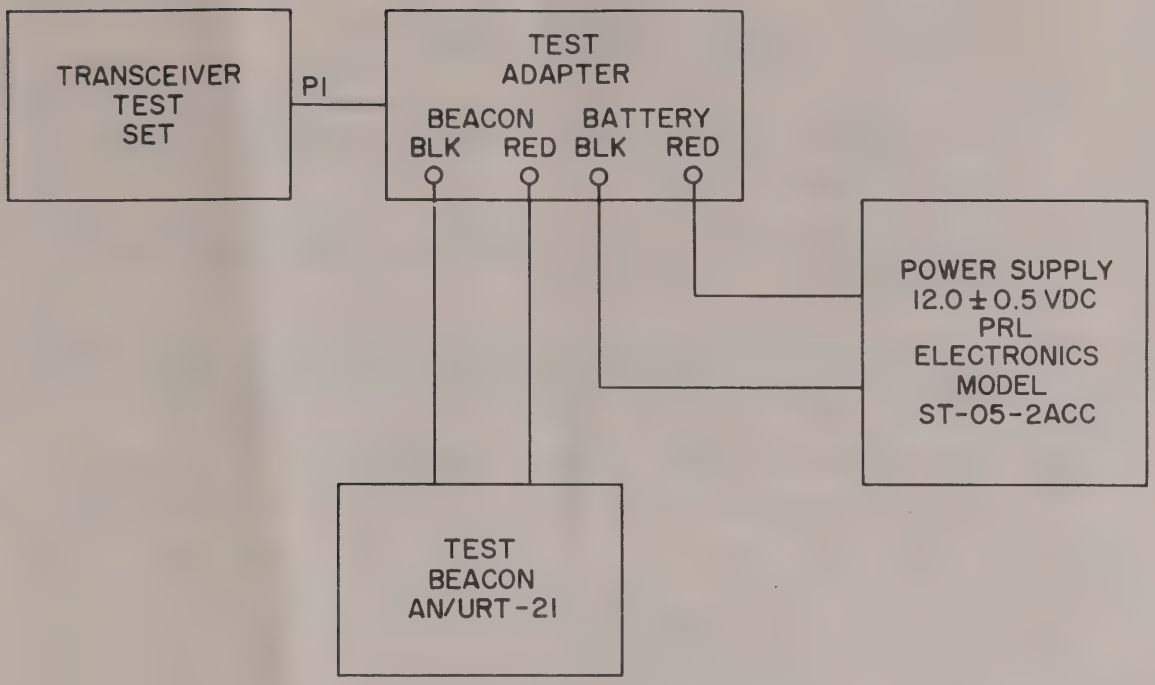


Figure 5-2. RF Power Calibration Test Setup

d. Adjust R6 until the Transceiver Test Set TRANSMITTER RECEIVER PERFORMANCE meter reads one-half of full scale deflection.

NOTE

Because of the 0.4 second on and 0.4 second off transmitter duty cycle of the AN/URT-21 Test Beacon, the performance meter will fluctuate. Meter reading is to be observed at maximum upward swing of pointer.

e. After R6 adjustment, tighten shaft lock-nut without turning shaft.

5-11. 200 MW POWER CALIBRATION OF AN/URT-21 BEACON. Any Beacon Set, Radio AN/URT-21 can be calibrated to an RF power output of 200 MW by adjusting the DC supply voltage to the proper value. The following procedure may be used to determine this voltage value.

a. Remove the battery cover plate from a Beacon Set, Radio AN/URT-21 and disconnect the battery from the beacon.

b. Connect an adjustable 0-to-12 volt power supply to the beacon terminals (red lead positive and black lead negative).

c. Connect the equipment as shown in figure 5-3.

d. Connect at Point A a CW, RF power source and adjust for a 200 MW level as noted on the calibrated wattmeter. At this setting observe the oscilloscope deflection.

e. Disconnect the CW, RF power source from Point A and reconnect the AN/URT-21 Test Beacon.

f. Adjust the power supply voltage until the maximum downward deflection of the oscilloscope is the same as that noted in step d.

g. Record the power supply voltage. This voltage is the calibration voltage required to obtain an RF power output of 200 MW from the Test Beacon.

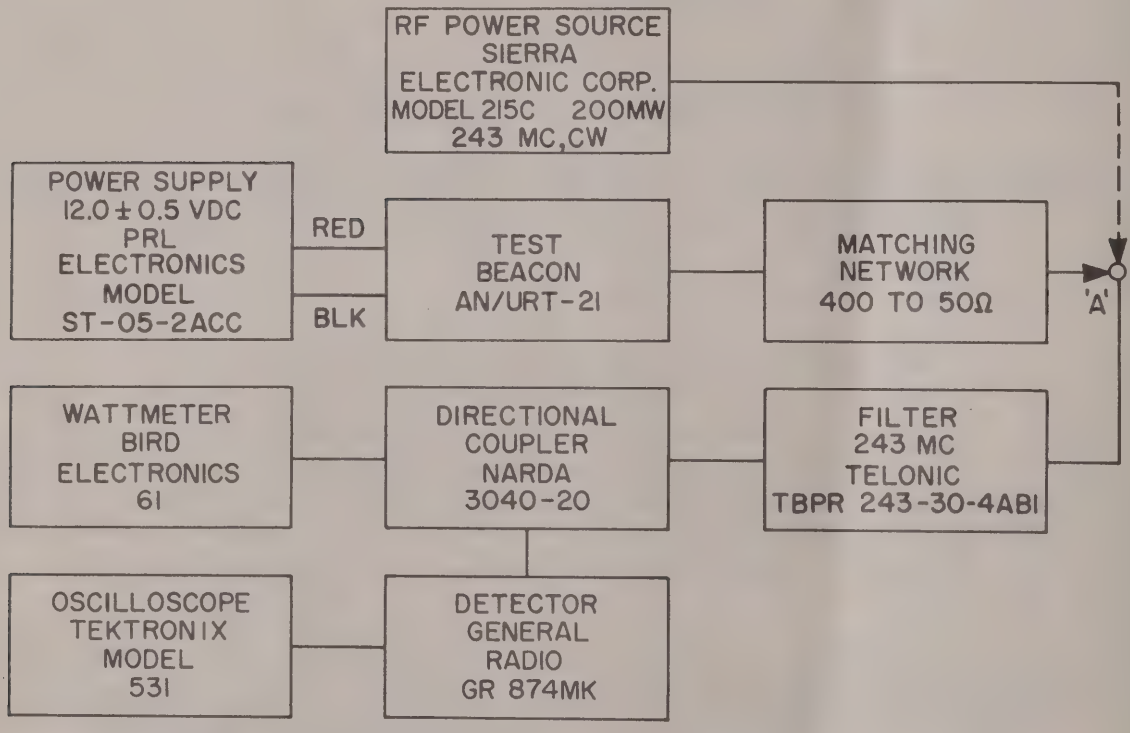


Figure 5-3. Test Beacon AN/URT-21 RF Calibration Test Setup

SECTION VI
REPLACEABLE PARTS

6-1. GENERAL

6-2. Replaceable parts are listed for Test Adapter MX-6877/URT-21 and MX-6878/URT-21.

6-3. TEST ADAPTER MX-6877/URT-21. Replaceable parts for Test Adapter MX-6877/URT-21 are shown in figure 6-1 and identified by index numbers. The index numbers are keyed to the table of replaceable parts. Index numbers with a single asterisk (*) identify parts used on MX-6877/URT-21 only.

6-4. TEST ADAPTER MX-6878/URT-21. Replaceable parts for Test Adapter MX-6878/URT-21 are shown in figure 6-2 and identified by index numbers. The index numbers are keyed to the table of replaceable parts. Index numbers with a double asterisk (**) identify parts used on MX-6878/URT-21 only.

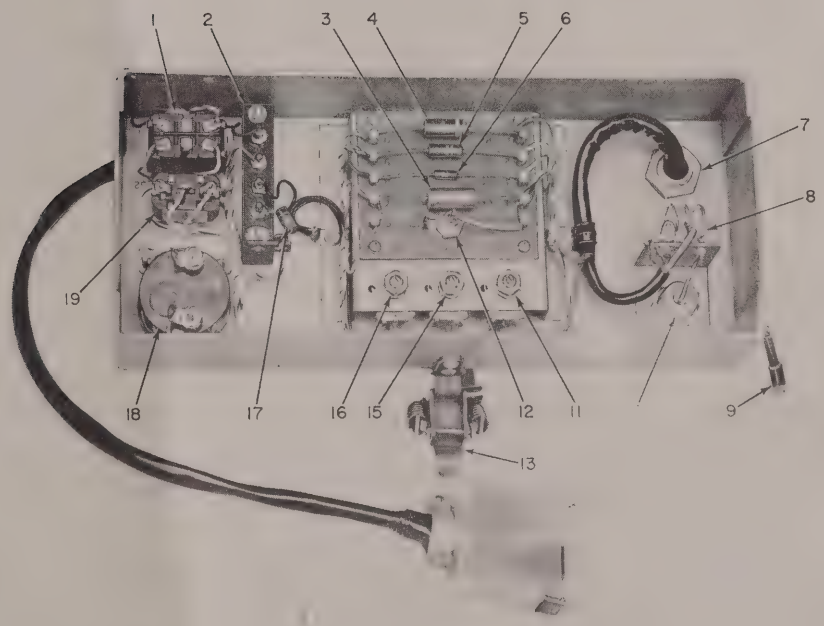


Figure 6-1. Test Adapter MX-6877/URT-21, Bottom Plate Removed

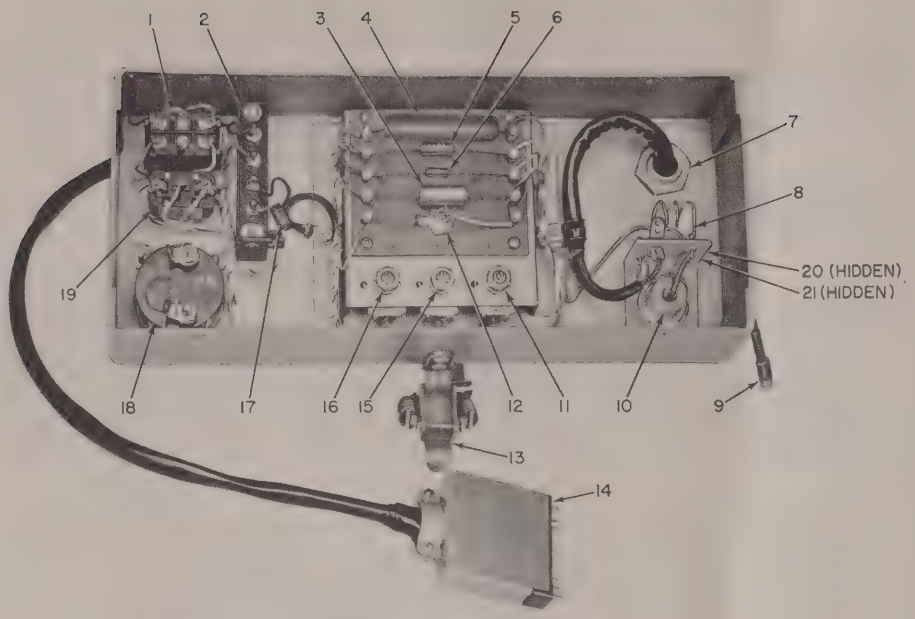


Figure 6-2. Test Adapter MX-6878/URT-21, Bottom Plate Removed

TABLE OF REPLACEABLE PARTS

Index No.	Ref.	Description	Military Standard or Magnavox Part No.
1	S1	Switch	MS35059-23
2	J1	Plug	188911-801
3	C1	Capacitor	CS13AE101K
4*	R1	Resistor	RC42GF390K
4**	R1	Resistor, Wire Wound, 1500 Ohm, 20 Watt	245001-8
5	R2	Resistor	RW69V1R0
6	R5	Resistor	RC20GF103K

TABLE OF REPLACEABLE PARTS (CONT)

Index No.	Ref.	Description	Military Standard or Magnavox Part No.
7	--	Clamp, Cable Retaining	188913-2
	--	Washer, 5/8 inch Internal Tooth	107006-525
	--	Sleeving, Cable	445007-919
	--	Clamp, Loop	NAS1397K5B
	--	Washer, Loop Clamp	109605-5
8	L1	Inductor 0.08 MHY	368433-1
	--	Terminal	208899-1
9	W1	Wire, Ground Assembly	469603-801
10	--	Insulator	446361-1
	--	Contact	168618-1
	--	Spring, Compression	438133-1
	--	Washer, 5/8 inch, Internal Tooth	MS35333-80
	--	Nut, 5/8 x 24	107252-302
	--	Pin, Cotter	MS24665-153
11*	R6	Resistor	RV5LAXSB253A
11**	R6	Resistor	RV5LAXSB101A
12	CR1	Diode	1N1594A
13	--	Latch	SC-D-20640
	--	Pad, Cushioning	999434-1

TABLE OF REPLACEABLE PARTS (CONT)

Index No.	Ref.	Description	Military Standard or Magnavox Part No.
14	P1	Connector and Hood, 14 Contact, Rectangular with two coaxial contacts	188912-1
15	R4	Resistor	RV5LAXSB153A
16	R3	Resistor	RV5LAXSB101A
17	L2	Inductor	MS75008-28
	--	Standoff	208955-1
18	M1	Meter	557870-1
19	S2	Switch	MS35058-23
20**	C2	Capacitor, 100 MMFD	255002-125
21**	L3	Inductor	MS75008-28

* Used on MX-6877/URT-21 only

** Used on MX-6878/URT-21 only